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Notes on the industrial development  
of the state of Illinois

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**NOTES ON THE INDUSTRIAL DEVELOP-  
MENT OF THE STATE OF ILLINOIS**

**BY**

**JOSE MARIA ROMS**

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**THESIS FOR THE DEGREE OF BACHELOR OF SCIENCE**

**IN MECHANICAL ENGINEERING**

**IN THE**

**COLLEGE OF ENGINEERING**

**OF THE**

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May 31 1901

THIS IS TO CERTIFY THAT THE THESIS PREPARED UNDER MY SUPERVISION BY

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of Illinois

IS APPROVED BY ME AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE

DEGREE OF Bachelor of Science in Mechanical Engineering

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NOTES ON THE INDUSTRIAL DEVELOPMENT  
OF THE  
STATE OF ILLINOIS

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## I.-INTRODUCTION

After several years of residence in the state of Illinois, the writer having become interested in the phenomenal growth of its industries, and finding little material accumulated on the subject in the many histories of the state, he has decided to bring together a considerable amount of material that he has collected and present it in such a way that the progress of the state in any of the most important industries may be easily grasped from tables and curves.

The writer deplores the lack of information regarding the industrial achievements of Illinois. It is too often forgotten that the wealth of communities is not the product of bloody wars, accounts of which fill our text books of history, but the result of long and undisturbed peace, and that the development of industry is the only safe means of increasing the wealth of the state. Even the rich soil of the prairies had to be won over by the ax and by the plow. Without industry the most bountiful soil gives naught. The richest and finest minerals have to pass thru the crucible, and almost all of the agricultural products have to undergo many industrial processes before reaching their fullest value to the consumer. It is out of a sincere admiration for Illinois that these Notes have been written, not with a view to exhaust facts and figures, but in a humble way to create an incentive to the writing of better and more complete works of this character by persons better acquainted with the state and with more ability than the writer.

The plan followed is to present in tabular form the number of



establishments, wage earners, wages, capital invested, and values of products for every census year in the last 40 or 50 years, for every important industry in the state of Illinois, and also the value of the products for the same years for the United States. Curves showing the value of the products for each of those industries for the census years are plotted, thus affording a means of graphical comparison between the growth of any important industry in Illinois and in the United States. Explanations of the tables are made and also some conclusions suggested by them as to the future development of the industry under consideration. While personal anecdotes connected with the growth of Industrial Illinois have not been given at all, it is firmly believed that in future works that phase of it would prove of invaluable benefit in stirring the ambition of young Illinoisans to imitate, within modern conditions, the pluck and courage of the hardy pioneers, whose noble achievements entitle them to be remembered with respect by the generations to come. This work has been divided into six chapters, including the introduction. In the second chapter, the manufacturing industries directly related to agriculture are treated, that is, agricultural implements, meat packing, flour and grist mills, and distilled liquors. In the third chapter the coal and smelting industries are considered. While coal mining is not a manufacturing industry, the production of coal is so important to the development of all the manufacturing industries, that a place has been given to it in these notes. In the fourth chapter the production of power is discussed and also the comparative growth of different kinds of power is given. In the fifth chapter the growth of other important industries, such as foundries, and clothing, is shown and a summary for 38 of the most important industries showing the present status of manufacturing in Illinois is also given. A final





chapter gives two additional tables relative to the grand total of all the manufacturing industries of Illinois and of the United States for the last 55 years, with general considerations as to the probable future growth of Illinois as an industrial commonwealth.

It is hoped that this plan is clear and that it will prove convenient for the purpose of finding concise information. While many pamphlets and publications have been read, in the main, the data is taken from the Reports of the Census Bureau of the Government of the United States, which are considered to be the most reliable and least partisan source of information.



## II. AGRICULTURAL IMPLEMENTS and RELATED INDUSTRIES

### Agricultural Implements.

The situation of Illinois is almost ideal for the development of agriculture and of the methods of cultivation. Except for a few tracts of woodland near the rivers which border and cross the state in every direction, all the soil of this commonwealth was ready for the plow and for the seed when the earlier French settlers established themselves in the rolling prairies of the Illinois; The fertility of the soil and the climatic conditions have insured the production of large crops, but without the rapid development of agricultural implements, it is doubtful whether Illinois would ever have assumed the important rank in material wealth which she now holds among the states of the Union. Although the railroads have helped in the disposal of the surplus production, yet even before the construction of railroads this state could send its products directly to any part of the world, thru the great lakes, the Ohio and the Mississippi rivers which are navigable to a large extent. It is therefore proper to give a good deal of credit to the invention and perfection of the machinery in use on the farm, as they truly revolutionized the farming industry, both in this country and abroad.

At the outset this industry was very widely distributed and there was scarcely a blacksmith of any importance in the State that





did not engage in the manufacture or repair of agricultural implements. The instruments were simple and little capital was needed for such industries. With the increasing complexity of the machines and the demand for more efficient implements, a concentration of industries has taken place, so that in 1905, while there were less agricultural implements establishments than in 1850, the value of the products had increased about 42 times during those 55 years. Six establishments in Chicago manufactured in 1900 more than 88 other similar establishments spread over the state.

It is mainly from harvesting implements that Illinois derives supremacy in this industry, although this state also leads all other states in the value of products of implements of cultivation. In 1905 Illinois produced nearly seventeen million dollars worth of harvesting machinery or about 55% of all the harvesting machinery produced in the United States and in implements of cultivation, twelve and a quarter million dollars worth, or 40% of the production in the United States. Plate No. 1 shows the rapid increase of the values of agricultural implements produced in Illinois, as compared with the increase in the United States for the last 55 years. It is unlikely that the decrease reported in 1905 for Illinois is more than temporary, since it is due primarily to the fact that many of the large plants had an unusual amount of implements in stock at the close of the season of 1903, and therefore the amount of production in 1904, the year to which the census figures have reference, suffered considerably. The fact that the capital engaged in the manufacture of agricultural implements has increased 15% in those five years seems to indicate that the climax in production has not been reached.





CURVE SHOWING THE  
VALUE OF AGRICULTURAL IMPLEMENTS  
MANUFACTURED IN ILLINOIS  
FROM 1850 TO 1905

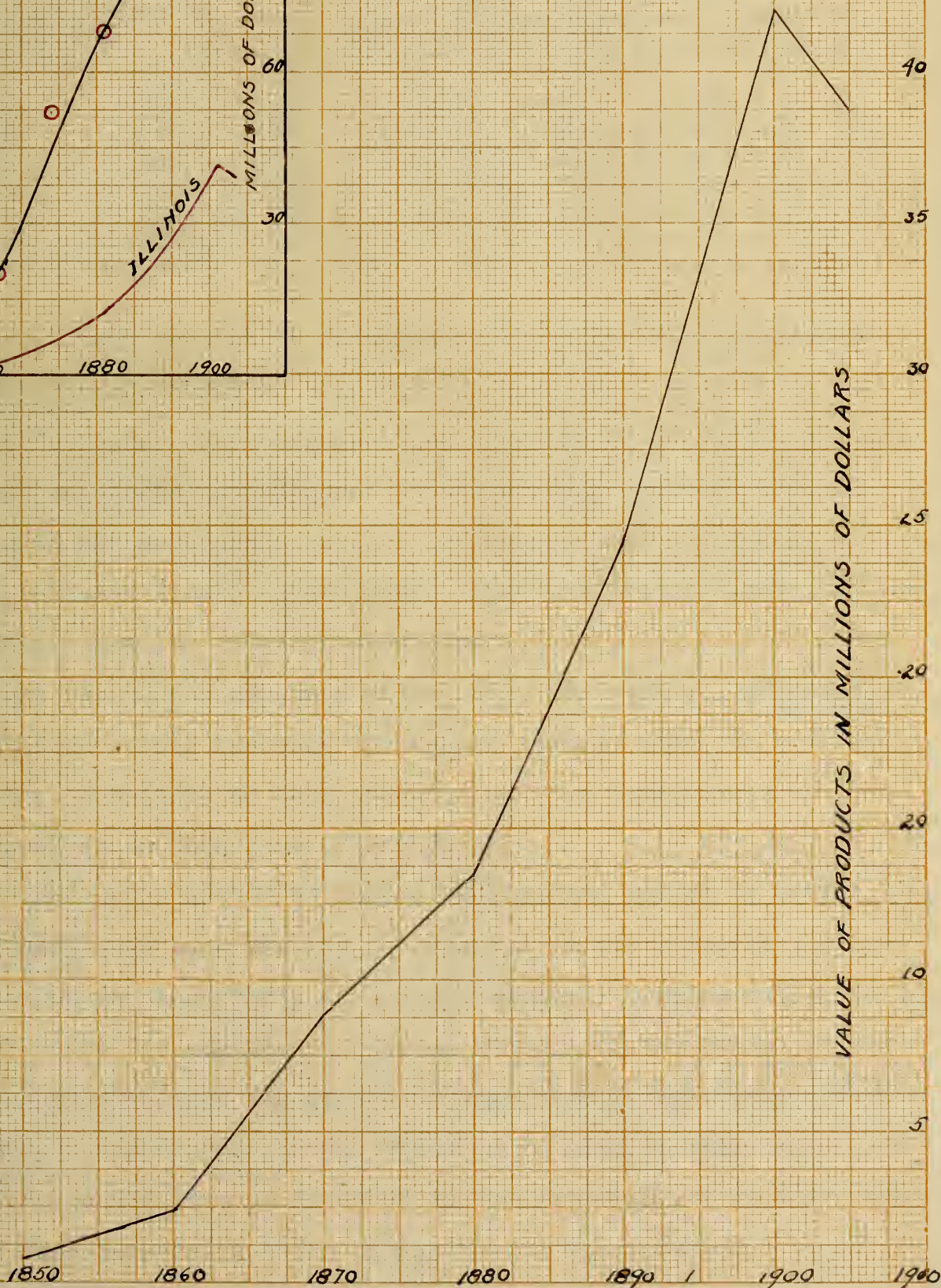
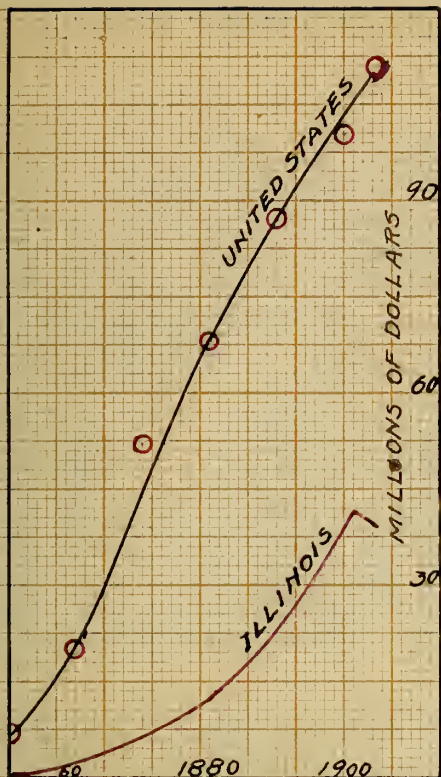






Table I.-AGRICULTURAL IMPLEMENTS

Year	No. of esta- blish- ments	Average No. of wage- earners	Capital invested Illinois	Wages paid Illinois	Value of product		Percent in- crease-value of products	
					in Illinois	in the U. S.		
		Illinois		-in thousands of dollars-				Ill.
1850	84	646	255	216	762	6 843		
1860	201	1 790	1 967	673	2 379	20 832	212	204
1870	294	3 935	5 351	1 814	8 880	52 067	274	150
1880	220	7 300	11 307	3 187	13 499	68 640	52	31.9
1890	100	10 487	48 639		24 610	81 272	82.5	18.4
1900	94	18 231	62 202	9 065	42 034	101 207	71	24.7
1905	82	15 359	71 383		38 412	112 007	- 8.6	10.8

The average percent of increase of the value of agricultural implements manufactured in Illinois has been 124.2 per decade for the last 55 years. The corresponding increase of the value of agricultural implements manufactured in the United States is 80%.

The above table shows in the first place that the amount of capital invested in the agricultural implement industry has increased much faster than the value of products. This is due to the increasing demand for better machines which calls for more costly methods of production. This increase in capital insures also, to a large extent, the stability of this industry and the continuance of Illinois supremacy in this line of manufacture.

Another point worthy of notice is that the amount of manual labor has decreased considerably in relation to the value of the products during the last fifty five years, which indicates either that the implements are now more costly on account of the change of material from wood to iron and steel, or that more operations which were performed by men are now being performed by special machinery. Probably both causes have contributed in the establishment of this relation of wage earners to value of implements manufactured.



The most striking consideration, however, suggested by table I is that the progress of this industry is more rapid in Illinois than in the country taken as a whole. While in 1870, Illinois produced 17.3% of the agricultural implements in the United States, in 1880 this percentage was 19.6, in 1890, 30.3, and in 1900 it reached the maximum figure of 42.

Another important feature in the progress of the implement industry is that of increase in mechanical power used. In 1890, 90 establishments reported as using 11,371 horse power, and in 1905, 76 factories reported the use of 46,648 horsepower or an increase in those fifteen years of 297% while in the same period the value of the products has increased only 56 percent.

Plate I presents graphically the value of agricultural implements manufactured in Illinois from 1850 to 1905, the points plotted being the values for the census years. The smaller figure in the upper corner of plate I, shows the value of the agricultural implements of Illinois in comparison with the total value of all agricultural implements manufactured in the United States. It will be noted that during the later years the production of Illinois has been a very considerable percentage of the total.





## Slaughtering and Meat Packing.

Slaughtering and meat packing are the most important manufacturing industries in the state, based upon the value of the products. Preparation of meats has progressed along with agricultural development during the last thirty years.

The packing of meats was begun in Chicago in 1836, even before the city was incorporated. To-day Chicago is the great live stock market for the West and the Northwest, and the extensive stockyards are one of the "sights" of the city. This industry also shows the advantages of concentration. In 1900, 64 establishments are reported by the Census as compared with 81 establishments in 1890.

In 1900, the products of this industry in Illinois were valued at \$287,992,000, which is equivalent to 22.9% of the total value of all the manufacturing products of the state for that year. Illinois also leads by far all the other states in this industry, the value produced amounting to 34 percent of the total value of meat slaughtered and packed in the United States.

The importance of this industry in the development of many minor industries can hardly be overestimated. The following remarks taken from the Census Report for 1900, show the uses to which the animal products are put, and imply the strong relation to other industries:- "The flesh is sold as meat, the blood is dried and sold for clarifying purposes, the entrails are cleaned and made into sausage casings, the hoofs are turned into neats' foot oil, the parings of the hoofs, hydes and bones are converted into glue, the finest of the fats are turned into lard, butterine and the finest tallow, the cruder fats are made into soap grease, hydes are prepared for the manufacture of leather, the horns are sold to comb makers, the largest bones are





used for the making of knife handles and for other purposes, the switches and tail ends are sold to hair mattress makers and the short hair which can not be dried and curled for sale is sold to felt works. To these remarks we may add that the shipment of meats in large quantities, has developed two important industries in the state:- the refrigerating industry and the manufacture of the railroad cars used in that industry. As a matter of fact, most of the large packers, in order to insure themselves against car shortage or against discrimination by the railroads, are the owners of hundreds and thousands of freight cars for the transportation of their products, and as we shall see in another chapter, Illinois leads in the manufacture of steam railroad cars, due to a large extent to the increasing demands of the large packers of the state.

The following table shows the statistics of the slaughtering and meat packing industries for the years 1860-1905.

Table II.-SLAUGHTERING AND MEAT PACKING

Year	No. of esta- blish- ments	Average No. of wage- earners	Capital invested Illinois	Wages paid Illinois	Value of products		Percent in- crease-value of products	
					in Illinois	in the U. S.		
	Illinois		--in thousands of dollars--				Ill-	U. S.
1860	27	625	1 386	101	3 933			
1870	34	2 589	6 922	450	19 823	58 380	396	
1880	43	10 948	12 020	4 078	97 892	303 562	390	420
1890	60	18 178	40 318	11 069	200 415	562 667	105	81
1900	64	27 861	71 229	14 045	287 922	785 056	43	15.
1905	68	16 953	80 477	14 561	317 206	886 757	10	13

The average percent of increase of the value of slaughtered and packed meat in Illinois has been 210 per decade for the last 45 years. The corresponding increase of the value of meat slaughtered and pack-



ed in the United States for the last 35 years has been 154 .

Plate II presents graphically the value of meat slaughtered and packed in Illinois from 1860 to 1905, the points plotted representing the values for the census years. The smaller figure in the upper corner of plate II shows the value of the slaughtered and packed meat in Illinois in comparison with the total value of meat packed in the United States for census years from 1870 to 1900 inclusive. It will be noticed that the proportion of the production in Illinois to that of the United States has been steadily growing larger.

#### Flour and Grist Mill Products.

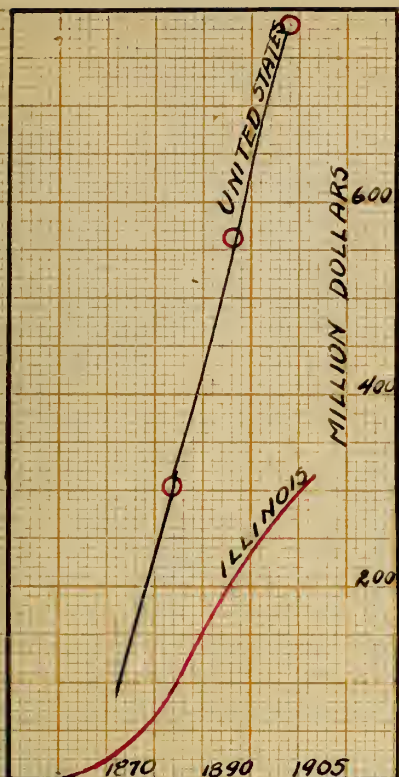
Wheat, corn, and oats form the most important crops of the state of Illinois, placing her in second place in the list of farming states in the United States. These cereals are transformed into wheat flour, rye flour, corn meal and flour and other products, in the mills. Wheat Flour constitutes the larger part of the products of this industry being for the year 1905, 71.1% of the total flour and grist mill products in the state.

In spite of the importance of Illinois as an agricultural state, and of the large production of cereals, this state was only fifth in the value of flour and grist mill products, in 1905, in the United States, and the value of these products represented that year only 5.45% of the value of all the flour and grist mill products of the United States for the same year. This is probably due to the fact that Illinois exports large quantities of grain, and also to the fact that an important part of her production of corn is used in the distilled liquor industry and for animal feed.

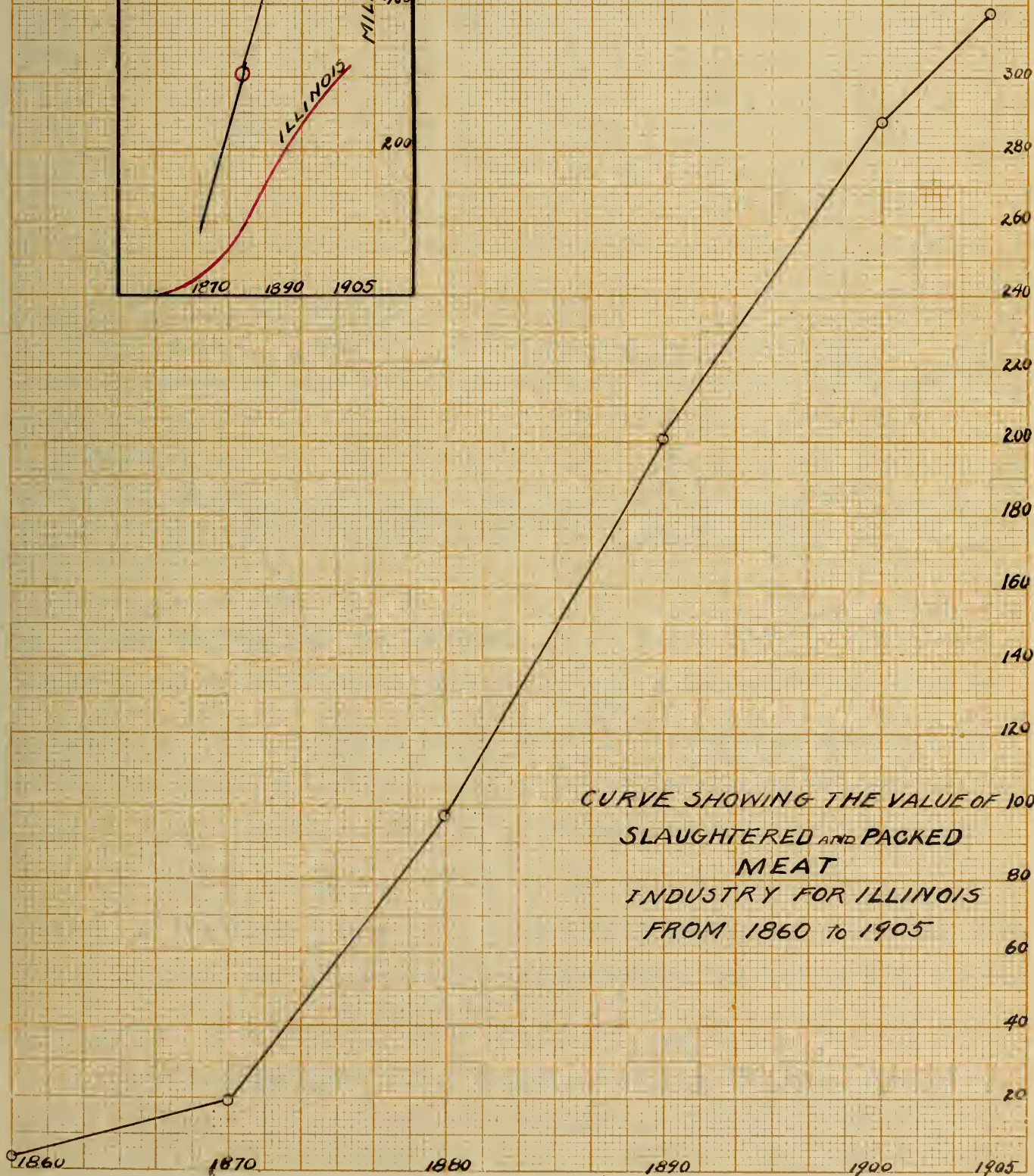
The following table shows the statistics of the flour industries



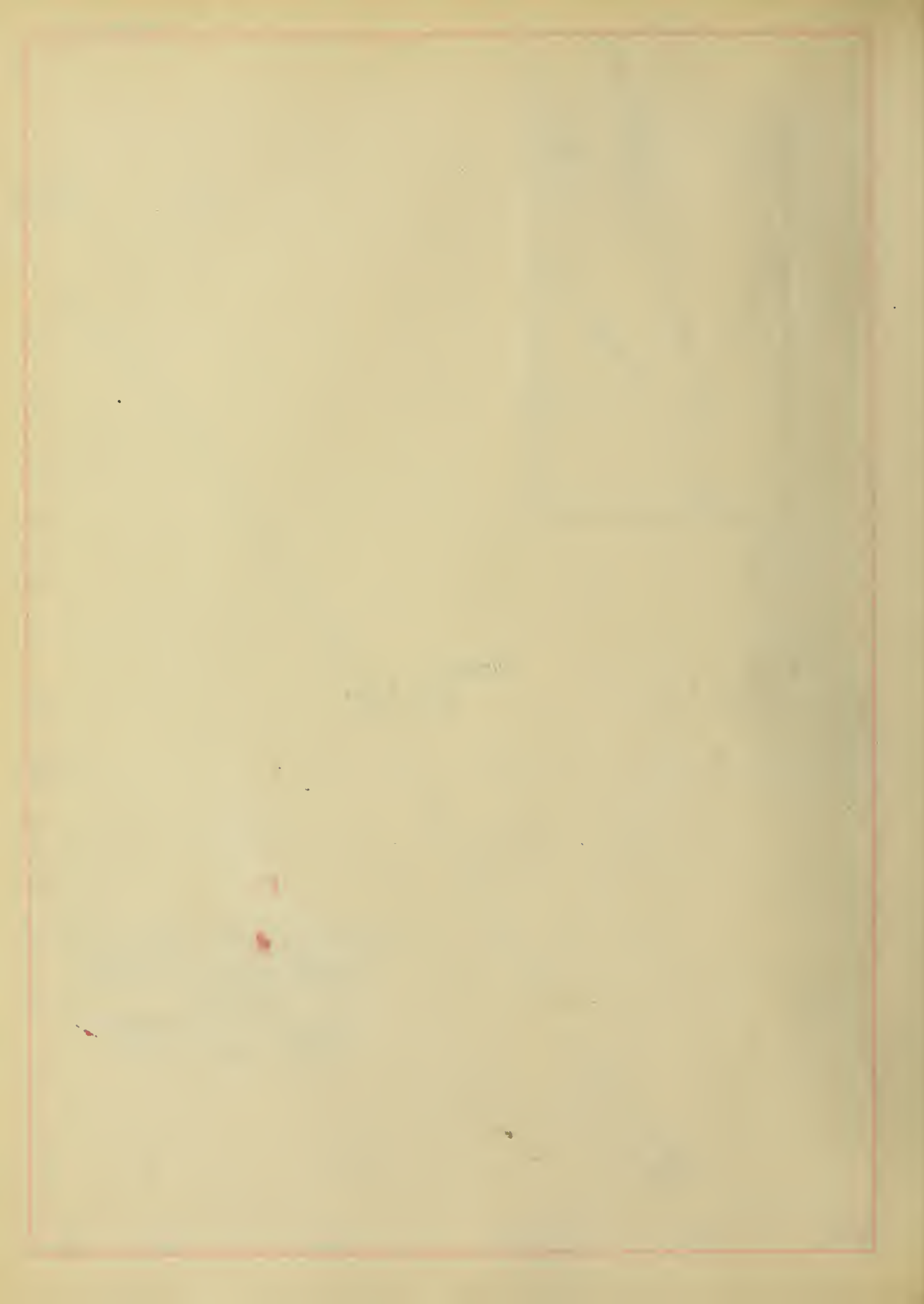




Millions  
of Dollars



CURVE SHOWING THE VALUE OF 100  
SLAUGHTERED AND PACKED  
MEAT  
INDUSTRY FOR ILLINOIS  
FROM 1860 to 1905





for both Illinois and the United States, for the years 1860 to 1905.

Table III.-FLOUR AND GRIST MILL PRODUCTS. Illinois

Year	Number of establish- ments	Average number of wage- earners	Capital invested	Wages Paid	Value of products	Percent increase value of products
			--in thousands of dollars--			
1860	550	1 942	5 636	684	20 662	
1870	941	4 457	14 827	1 881	43 877	112
1880	1 024	4 960	13 580	1 868	47 472	8.2
1890	647	4 385	13 102	2 049	37 975	- 20
1900	353	1 965	10 714	1 030	28 575	- 24.8
1905	363	2 410	14 128	1 211	39 892	39.6

Table IIIa.-FLOUR AND GRIST MILL PRODUCTS. United States.

Year	Number of establish- ments	Average number of wage- earners	Capital invested	Wages paid	Value of products	Percent increase value of products
			- in thousands of dollars-			
1860	13 878	27 692	84 486	8 721	248 580	
1870	22 573	58 448	151 565	14 578	444 985	79
1880	24 338	58 407	177 362	17 422	505 186	13.6
1890	18 470	63 481	208 474	27 036	513 971	+ 1.7
1900	9 476	37 748	189 281	21 543	501 396	+ 2.4
1905	10 051	46 525	265 177	27 175	731 033	+45.7

The average percent increase of the value of flour and grist mill products in Illinois has been 25.6 per decade for the last 45 years, and for the United States the percentage has been 30.6.

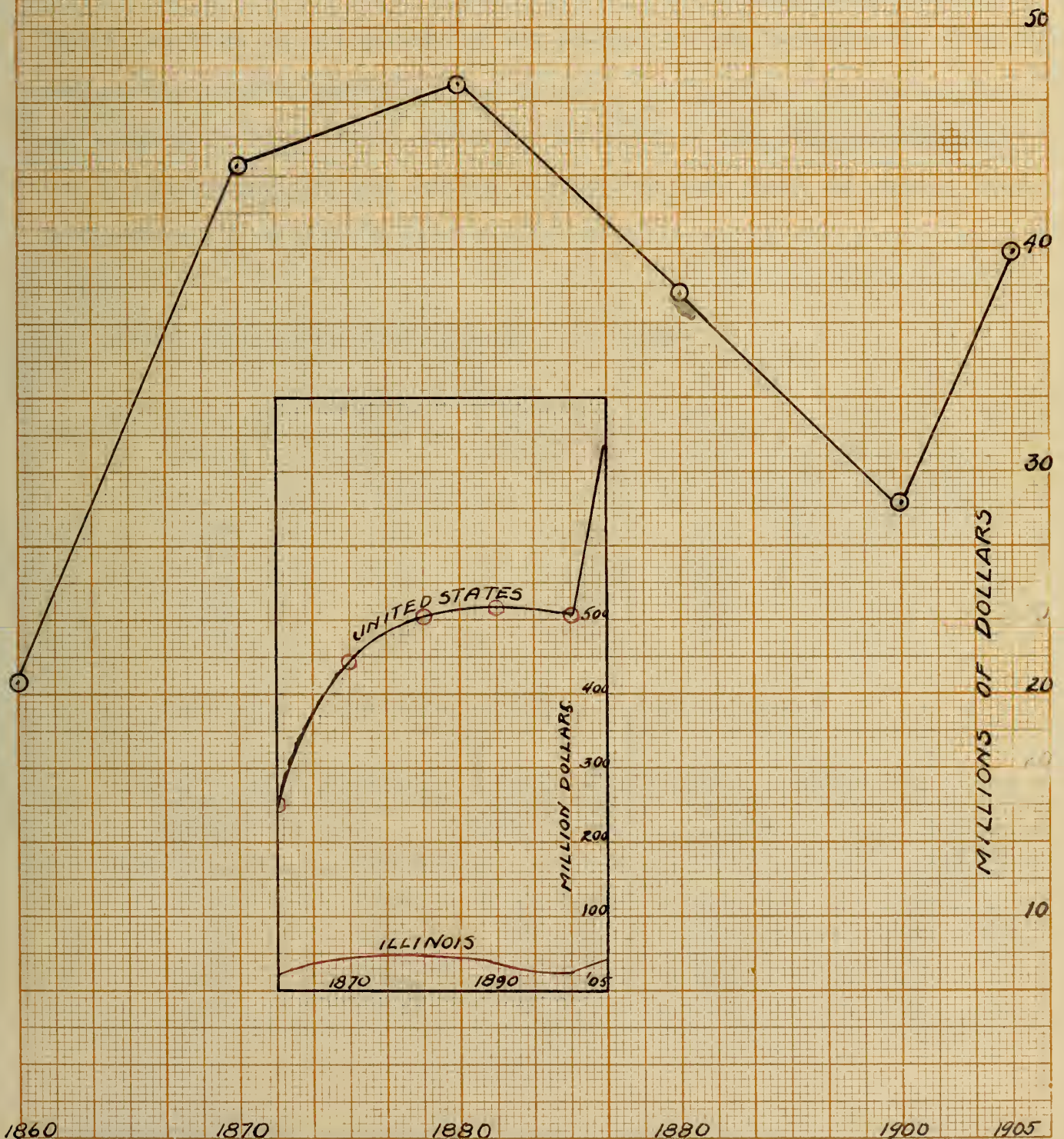
The table shows that Illinois is not increasing as fast as the United States in the production of flours and other mill products.

Plate III presents graphically the values, in millions of dollars, of the flour and grist mill products produced in Illinois from 1860 to 1905, the points plotted representing the values for the census years. The smaller figure in the lower half of the plate shows the production of flour and other grist mill products as compared with the total value of similar products produced in United States.





CURVE SHOWING  
VALUE OF  
FLOUR & GIST MILL PRODUCTS  
IN ILLINOIS  
FROM 1860 TO 1905







## Distilled Liquors.

In the manufacture of distilled liquors Illinois ranked first in the United States. Most of the distilled liquor made in this state is whiskey manufactured from corn, in the production of which grain Illinois leads all the other states in the Union. Peoria is the seat of this industry and incidentally it is the city from which more internal revenue is collected by the United States Government, than any other city in the country.

The following table shows the statistics for this industry, both for Illinois and for the United States, for the last 35 years, from 1870 to 1905.

Table IV.- DISTILLED LIQUORS. Illinois

Year	Number of establish- ments	Average number of wage- earners	Capital invested	Wages paid	Value of products	Percent increase value of products
			- in thousands of dollars-			
1870	45	958	2 513	550	7 889	
1880	36	2 114	3 438	935	14 601	86
1890	7	1 023	8 782	825	51 997	324
1900	20	338	3 165	192	38 208	- 26.6
1905	11	692	5 456	407	54 102	41.7

Table IVa.- DISTILLED LIQUORS. United States

Year	Number of establish- ments	Average number of wage- earners	Capital invested	Wages paid	Value of products	Percent increase value of products
			- in thousands of dollars-			
1870	710	5 131	15 545	2 020	56 101	
1880	844	6 502	24 248	2 664	41 064	13.6
1890	440	5 343	31 006	2 815	104 198	154
1900	965	4 381	32 540	2 622	96 794	- 7.1
1905	805	6 435	50 101	4 050	131 270	35.8



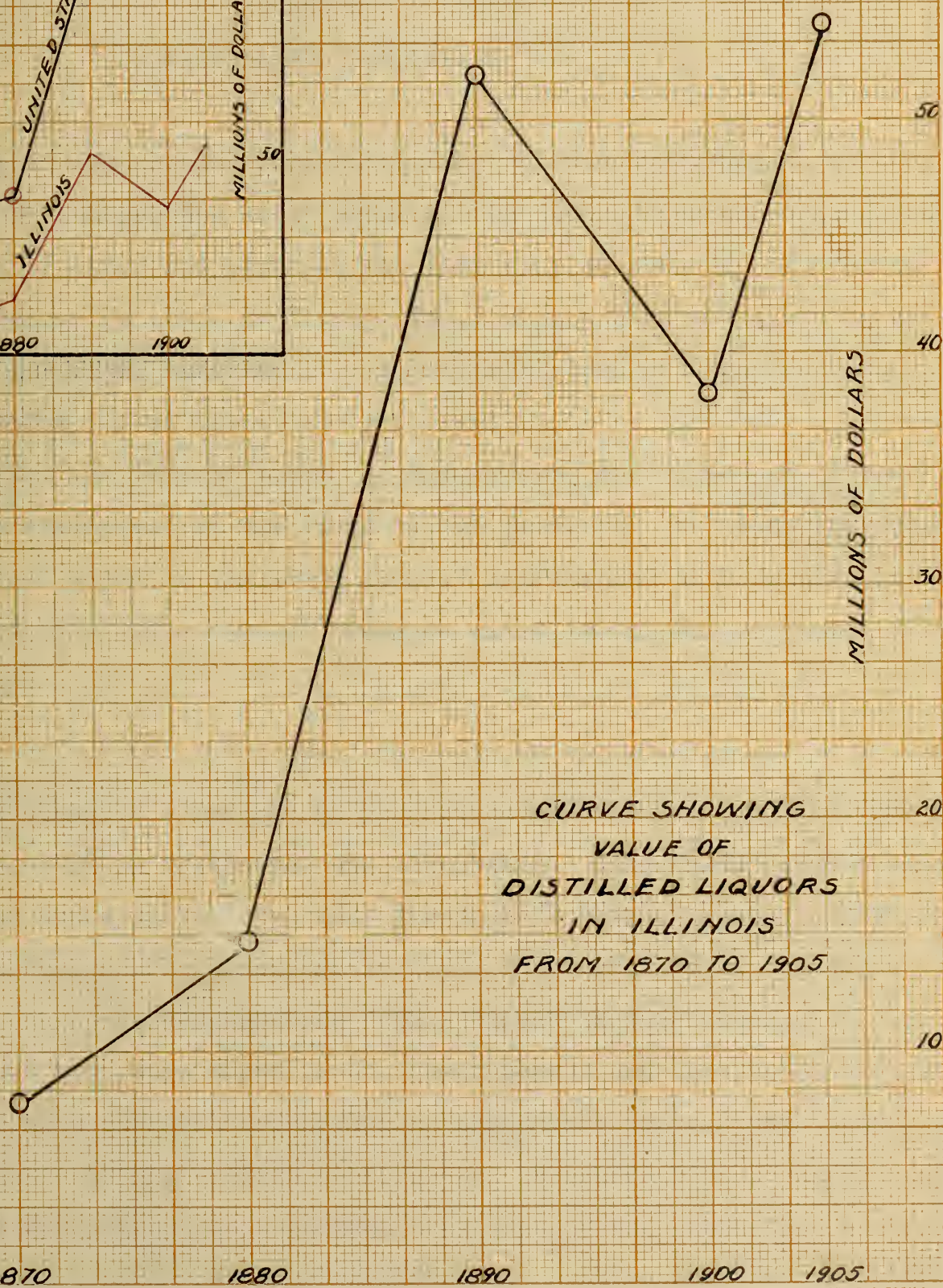
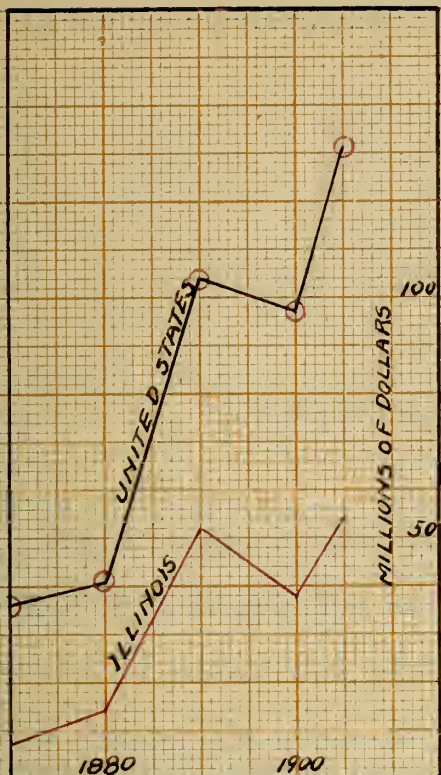
The average percent of increase of the value of distilled liquors manufactured in the state of Illinois has been 121.5 per decade for the 35 years ending in 1905, while the corresponding increase for the distilled liquors manufactured in the United States during that period has been only 59 percent.

The table also shows that in 1905 Illinois manufactured 41.4 percent of all the distilled liquors manufactured in the United States.

Plate IV presents graphically the value of distilled liquors manufactured in Illinois from 1870 to 1905, the points plotted representing the values for the census years. The smaller figure in the upper corner of plate IV shows the values of all the distilled liquor manufactured in the census years in Illinois in comparison with the distilled liquors manufactured in the United States.







CURVE SHOWING  
VALUE OF  
DISTILLED LIQUORS  
IN ILLINOIS  
FROM 1870 TO 1905





## II. MINING AND QUARRIES

and the

### IRON AND STEEL INDUSTRIES

Mining was not an important feature of the early development of the United States, and until recently the information concerning the products of mines and quarries has been very meager. In the United States Census reports, statistics about mining were not given in separate form until 1870 and it was not until 1890 that the reports were vouched for as being nearly correct.

Of all the mineral products, coal is the most important viewed from the standpoint of the value of the products. In 1902, the value of the coal mined in the whole country represented 46.1 percent of the value of all the mineral products mined in the United States that same year.

#### Coal.

The state of Illinois has the privilege of being the first one in the country in which coal was discovered. This discovery was made by Father Hennepin in 1679, near the present city of Ottawa; there was no actual mining, however, in the state, until 1810. In 1832, several boatloads were shipped from Illinois to New Orleans, and in 1833, 6000 tons were mined in St. Clair county and sent to St. Louis. The coal area embraces two thirds of the entire state. The product is a bituminous coal, which at first was thought would not be of much use, but which with the increased knowledge of the combustion of fuel,



is used to-day for practically the same purposes as the hard anthracites of Pennsylvania are used.

In the production of coal Illinois stands second only to Pennsylvania, and has an output of 51 million tons valued at 54 million dollars for the year 1908.

The following table shows the production of coal in tons, for the census years from 1880 to 1908, and percent increase, both for Illinois and for the United States.

Table V.- COAL MINED

Year	Coal mined in Illinois, in tons	Coal mined in the United States. tons	Percent of increase	
			Ill.	U. S.
1880	5 460 158	63 822 830		
1890	12 638 364	140 866 931	131	122
1900	25 153 909	240 789 309	107	71
1902		269 874 836		12
1905	37 183 374		48	
1908	49 272 452		33.	

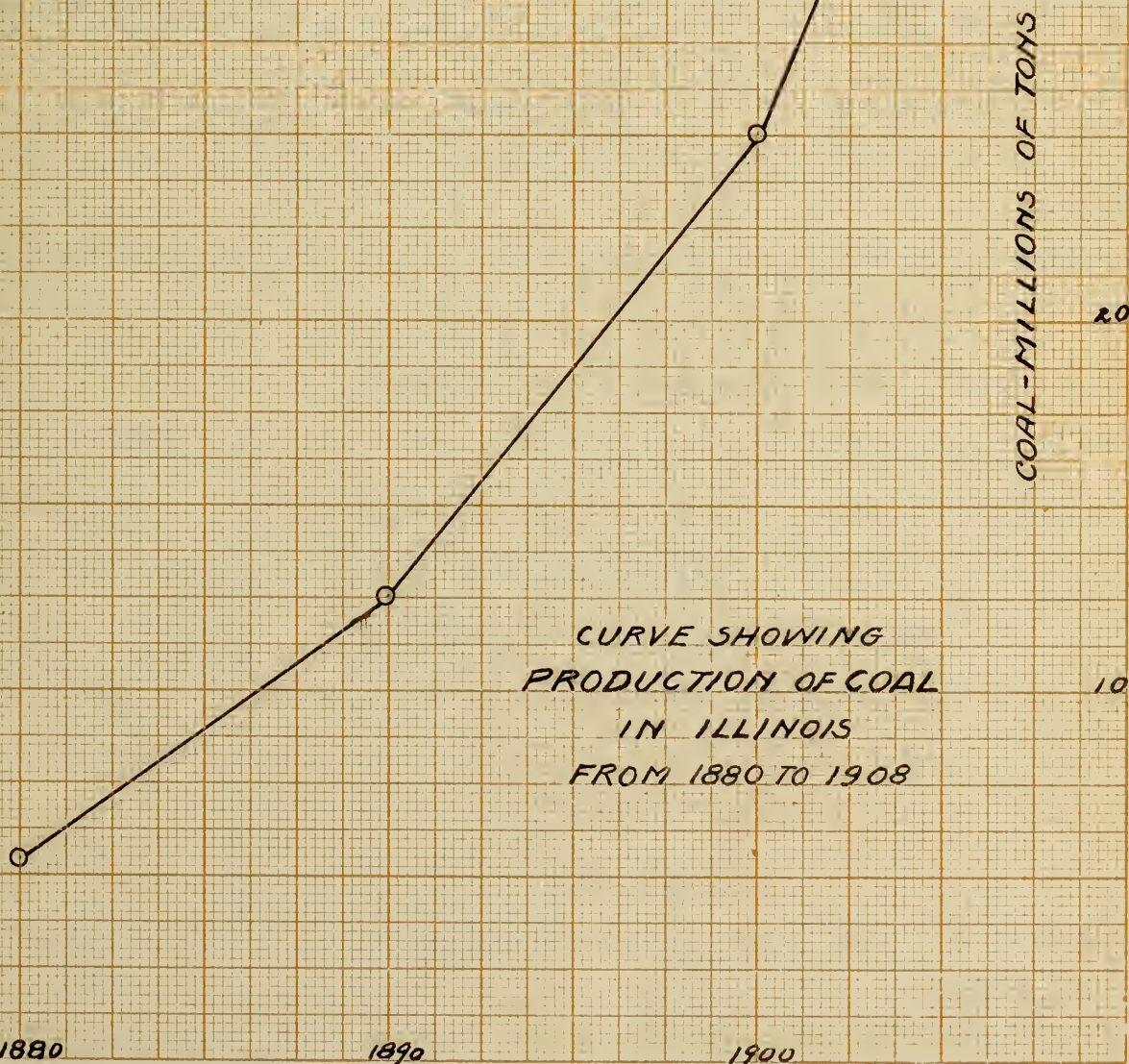
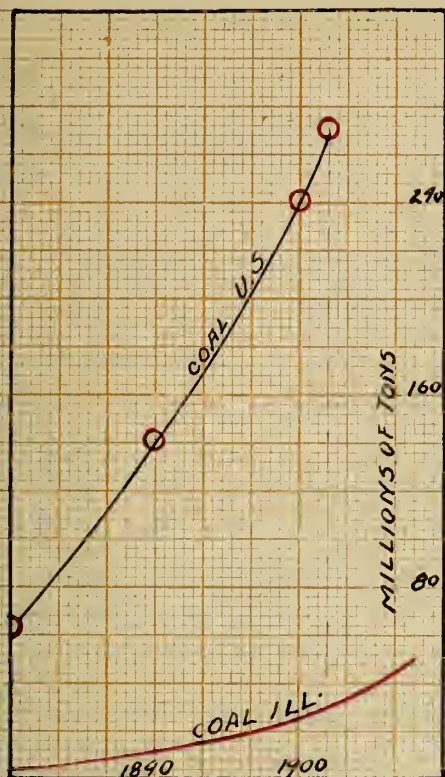
The table shows that the production of coal in Illinois is increasing at a higher rate than in the country as a whole. This increase is significant in that coal is by far the most important fuel for the generation of power, which is the basis of modern industrial development.

Plate V. shows graphically the coal output of coal in Illinois from 1880 to 1908, the points plotted being for the same years as given in table V. The smaller figure in the upper corner of plate V. shows the output of Illinois coal compared with the output of coal in the United States.

In other products of mines and quarries Illinois holds a prominent place among the states of the Union, second in lime stones and dolomites, fifth in clay products and in cement. The following table







CURVE SHOWING  
PRODUCTION OF COAL  
IN ILLINOIS  
FROM 1880 TO 1908





gives the total values of the mineral products of the state for the years 1906 and 1907.

Table V.-VALUE OF THE PRODUCTS OF MINES AND QUARRIES. Illinois

Products.	1906	1907
	thousands of dollars	
Coal . . . . .	44 763	54 687
Pig Iron (estimated). . . .	47 128	52 228
Oil . . . . .	3 276	16 432
Clay. . . . .	12 784	13 351
Zinc (estimated). . . . .	5 500	6 615
Limestone . . . . .	3 476	4 334
Portland cement . . . . .	2 461	2 633
Sand and Gravel . . . . .	1 043	1 368
Natural and slag cement . .	188	174
Fluorspar . . . . .	161	142
Mineral water . . . . .	77	92
Lead ore (estimated). . . .	46	46
Sandstone . . . . .	19	15
Pyrite . . . . .		5
Total. . . . .	120 922	152 123

The most notable feature of the mineral production in Illinois in the last few years is the constantly increasing output of oil, of which more than 24 million barrels were produced in 1907. While a decade ago Illinois did not figure as an oil producing state, it now holds third place, being surpassed only by Oklahoma and California.

The rapid increase in the mining products of the state has affected other industries to a large extent, which use minerals as prime materials. Of these industries the most important are the Iron and Steel industries.

#### Iron and Steel.

Illinois, with its large supply of coal and its proximity to the sources of iron ore in the Lake Superior region, which in 1902 produc-





ed 76 percent of all the iron ore in the country, is very well situated for the development of the important industry of Iron and steel. It is surpassed in this industry only by Pennsylvania and Ohio, which have been increasing at a faster rate than Illinois in the manufacture of these products. As compared to the other industries in the state the iron and steel industry occupies the second place from the point of view of the value of the products. This place was attained for the first time in 1905, for judging from the census reports of 1900, the second place was at that time held by the allied industry of foundry and machine shop.

The principal product from the steel mills was steel rails of which at the census of 1905, the number of tons produced in the state of Illinois represented about 25 percent of the total number of tons of rails produced in the United States. Since the steel rails are the product of a single establishment in Illinois, the figures are not obtainable from the census reports. The amount of rolled iron and steel and of direct steel castings for 1905 was \$60,021,925 or 71.4 percent of the total products of the iron and steel industry.

The statistics for blast furnaces are not presented in detail, in the reports, but Bessemer pig iron formed more than 85 percent of the total product of blast furnaces in Illinois.

The growth of the iron and steel industries have influenced to a large extent the production of power, of which this industry is the largest user in Illinois and also the foundry and machine shop industries, which use large quantities of pig iron and rolled iron and steel respectively.

The following tables give the statistics for the steel and iron industries for the years 1870 to 1905, for Illinois and the United States.



Table VI. IRON AND STEEL - Illinois

Year	Number of establish- ments	Average number of wage- earners	Capital invested	Wages paid	Value of products	Percent increase value of products
			-in thousands of dollars-			
1870	21				8 000	
1880	20	5 253	6 461	2 509	20 545	156
1890	26	7 734	32 472	4 916	37 173	81
1900	27	16 642	43 276	9 641	60 303	62.5
1905	27	18 358	58 539	11 469	87 353	45

Table VIa. IRON AND STEEL - United States

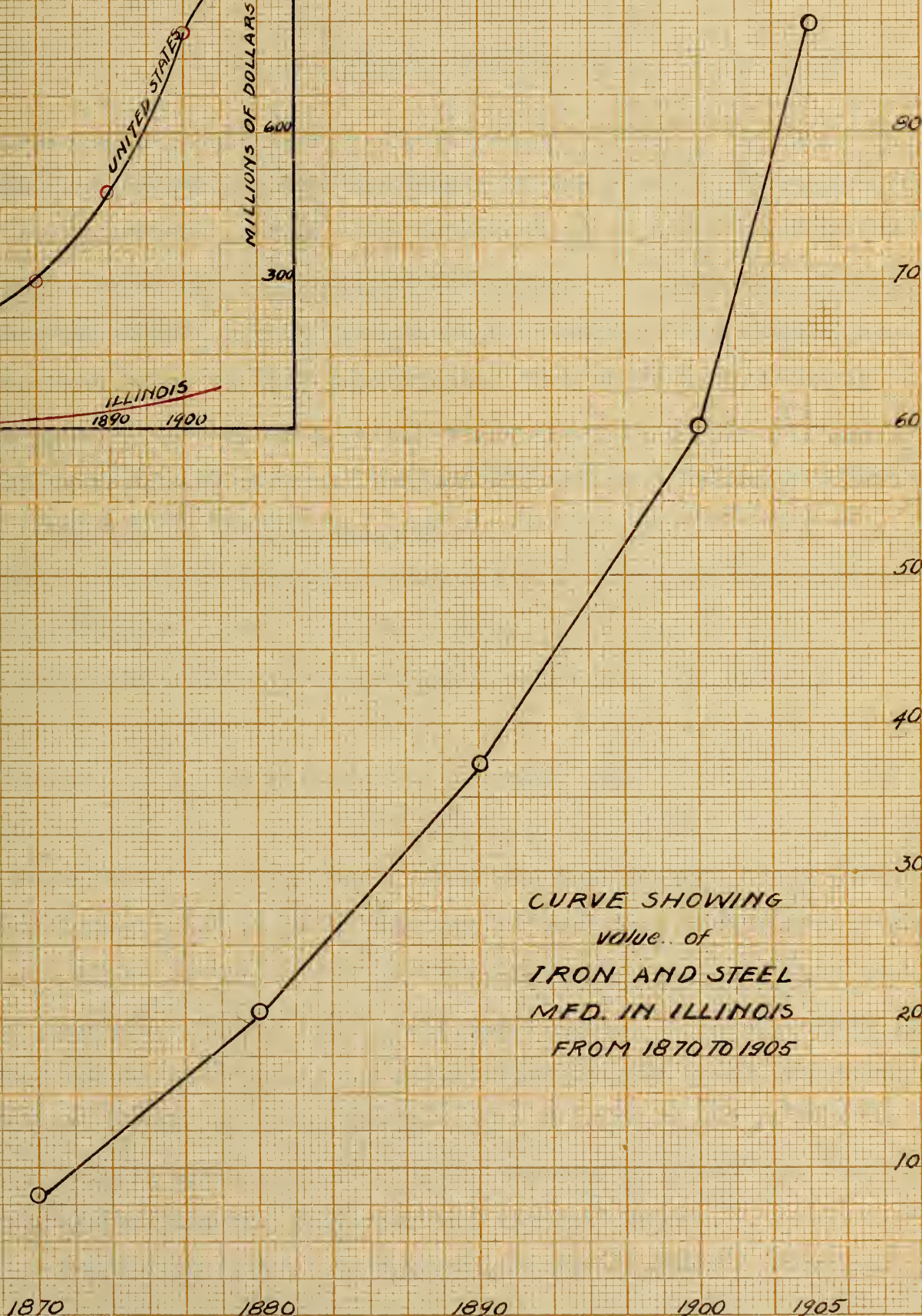
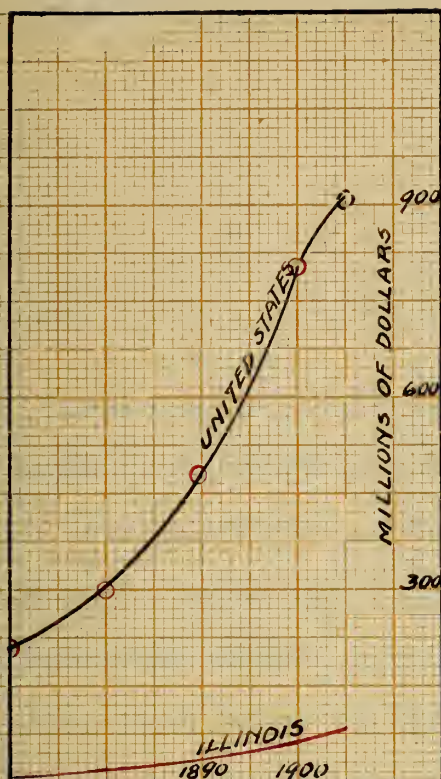
Year	Number of establish- ments	Average number of wage- earners	Capital invested	Wages paid	Value of products	Percent increase value of products
			-in thousands of dollars-			
1870	808	77 555	121 772	40 515	207 209	
1880	1 005	140 978	130 972	55 477	296 558	43
1890	645	152 535	372 678	84 665	430 954	45.2
1900	668	231 701	573 392	132 558	803 968	87
1905	605	259 201	936 328	162 178	905 788	12.6

The average percent increase of the value of iron and steel manufactured in Illinois, has been 107 per decade for the last 35 years, and for the United States the percentage has been 53.7, showing therefore that this industry is progressing more in Illinois than in the country taken as a whole. In 1905 the value of the Iron and steel manufactured in Illinois represented 9.6 percent of all the iron and steel manufactured in the United States.

Plate VI presents graphically the values of iron and steel manufactured in Illinois, from 1870 to 1905, the points plotted representing the values for the census years. The smaller figure in the corner of the plate shows the comparison between the production of iron and steel in Illinois and in the United States.







CURVE SHOWING  
value of  
IRON AND STEEL  
MFD. IN ILLINOIS  
FROM 1870 TO 1905





#### IV. POWER PRODUCTION

Modern industry is almost synonymous with power. The most significant fact in the Industrial history of the world is the invention of the steam engine by Watt. The substitution of machine power for human power since the beginning of the nineteenth century has changed the whole industrial system from the old cottage to the modern factory, from hard labor to easy supervision, from small production to immense output. It has made possible for laborers of the present day to enjoy as necessary ordinary commodities the most valuable luxuries of the potentate of a few decades ago.

Power and its consumption for industrial purposes is a good index of the development of the industries, for every application of mechanical power where hand power was used, means one step farther in the efficient production of valuable goods. Illinois has kept pace with the rest of the country as far as power used is concerned, but her rank in that respect is fifth, while in the value of manufactured products <sup>it</sup> is third. The states of Ohio and Massachusetts besides New York and Pennsylvania surpass Illinois in amount of mechanical power used, on account of the fact that Illinois manufactures a large amount of food products, using a relatively small amount of power, while both Ohio and Massachusetts manufacture more complex goods requiring a relatively large amount of power.

The largest users of power in the state of Illinois are the iron and steel mills and the foundries and machine shops.

An interesting feature of the production of power is the concen-





tration of power plants. In the Special Report of the Bureau of the Census on Central Electric Light and Power Stations, 1902, statistics are given showing that in the past few years the central stations have devoted special attention to the needs of industrial establishments for power. In large cities like Chicago it is now often much cheaper to get the power from a central station than for each industrial establishment to produce its own power. This is specially true of small users. The Commonwealth Edison Company is an striking example of the growth of central stations for the production of power. Splendidly situated to receive all the coal and water needed, built for the handling of large business and with the best obtainable staff of operating engineers, it has been extending its radius of influence every year and now is one of the best plants in the country producing electricity as cheaply as that produced at the Niagara.

Another important consideration is the decrease in importance of steam engines as a direct means of driving machinery. While in 1900, the percentage of power produced by steam engines was 85.1 per cent of the total, and in 1905 it was only 75.3 percent. The greatest increase in these five years has been in electric motors.

Gas and gasolene power has also increased considerably from 708 horsepower in 1890 to 12,319 in 1905. The gas producer and gas engine have been improved considerably in those fifteen years and the more modern application of blast furnace gases for the production of power will undoubtedly contribute to the increased use of gases as an agent for the production of power in the future.

Table VII shows the horsepower produced in Illinois and in the United States for different years of the census and the kind of generators used: steam, water, electricity, gas and gasolene. In "all other power", compressed air engines, hot air engines and chemical engines



are included.

Table VII. POWER PRODUCTION

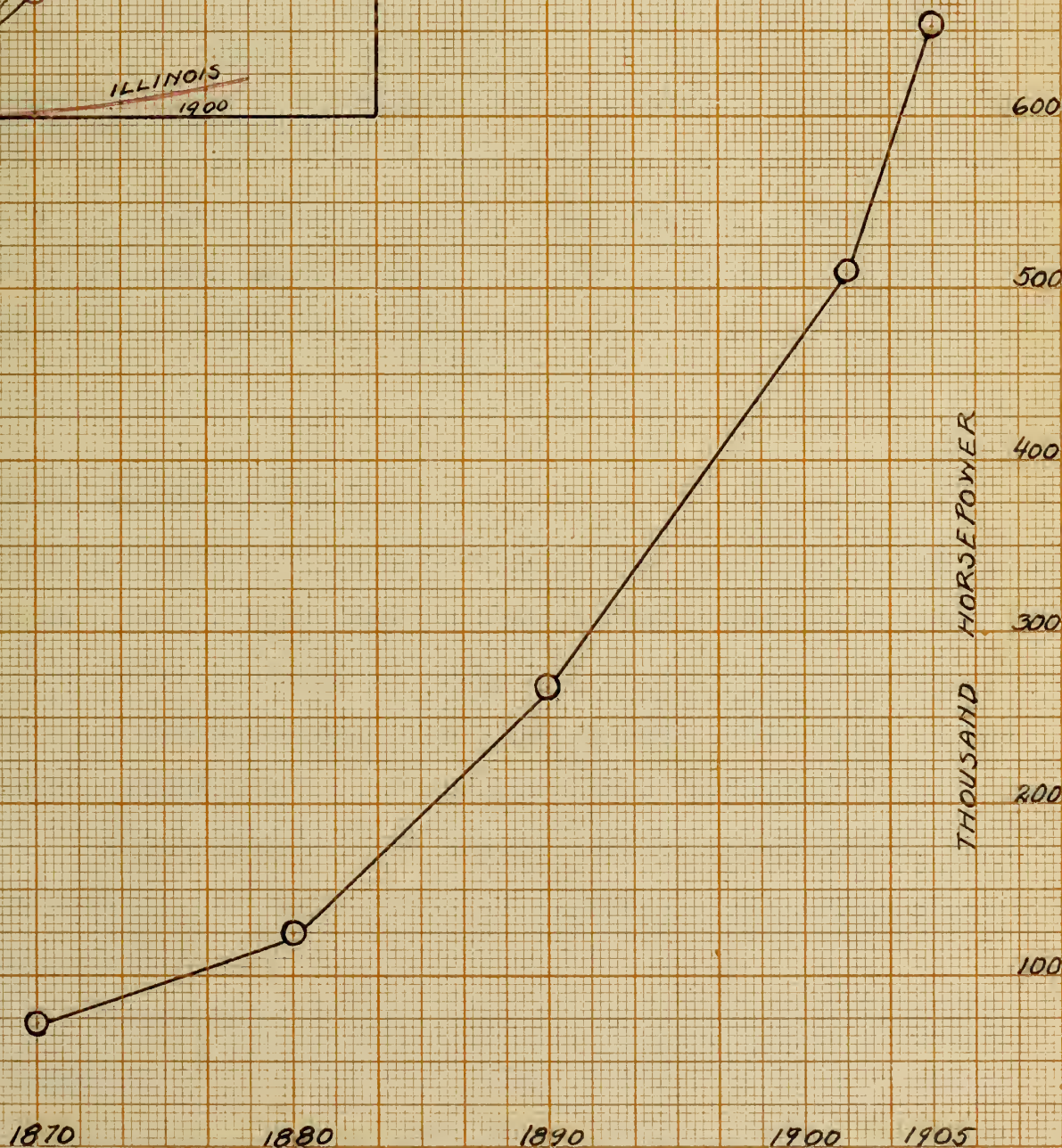
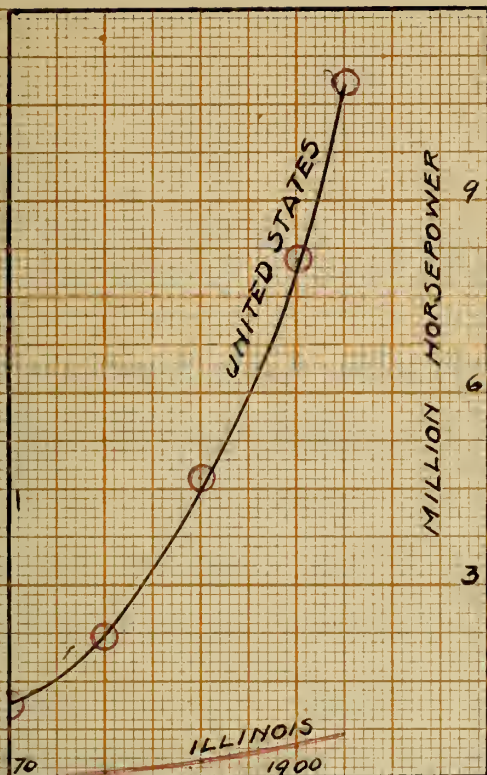
Kind of power	Year	Horsepower United States	Horsepower Illinois
Steam power	1870	1 215 711	73 091
	1880	2 185 458	126 843
	1890	4 662 029	268 486
	1900	8 140 533	507 471
	1905	10 828 111	651 578
Water power	1870	1 130 431	12 953
	1880	1 225 379	17 445
	1890	1 263 343	16 124
	1900	1 454 229	11 614
	1905	1 647 969	15 030
Electric power	1890	15 569	939
	1900	493 223	49 235
	1905	1 592 483	165 265
Gas & gsolene	1890	8 930	708
	1900	134 742	8 758
	1905	289 514	12 319
All other power	1890	88 572	6 753
	1900	319 475	27 096
	1905	632 905	53 519

Plate VII presents graphically the steam horsepower produced in Illinois from 1870 to 1905, the points plotted representing the horsepower produced in the census years. The figure in the upper corner of the plate shows the comparative production of steam horsepower for same years in Illinois and in the United States.





CURVE SHOWING  
NUMBER OF STEAM HORSEPOWER  
PRODUCED  
IN ILLINOIS  
FROM 1870 TO 1905







## V. OTHER INDUSTRIES

Illinois has a number of industries of importance a detailed account of which would make this work too voluminous. A short description of the foundry and machine shop industry, of the steam railroad car industry, and of the men's clothing industry will be given in this section. A complete summary will also be presented of the 38 most important industries in Illinois for the years 1900 and 1905, embracing the number of establishments, the capital invested in each industry, the average number of wage earners, the total wages paid and the total value of the products. They will be arranged in order of rank on the basis of the value of products in 1905. Wherever the rank has altered since 1900, the rank in 1900 is noted in the last column.

### Foundry and machine shop.

Illinois foundry and machine shop industry has been steadily increasing at a faster rate than the same industry for the United States. The large increase in capital of 63 percent in the period 1900-1905 is a guarantee that the industry will climb still higher. This industry ranks third in the state and is the second largest user of power. The products of this industry are as varied as the industries themselves, for the products of foundries and machine shops are everywhere in evidence.

In the manufacture of electrical machinery and apparatus, Illinois occupies third place in the United States, due largely to the





large production of small motors and to the manufacture of telephones in which latter industry Illinois is supreme, having manufactured in 1905 about 55 percent of all the telephones manufactured that year in the United States.

The following table gives statistical data of machine shop and foundry products in Illinois and in the United States for the census years from 1870 to 1905.

Table VIII. FOUNDRY AND MACHINE SHOP INDUSTRY. Illinois

Year	Number of establish- ments	Average number of wage- earners	Capital invested	Wages paid	Value of products	Percent increase value of products
			-in thousands of dollars-			
1870	80	1 697	2 450	1 062	2 819	
1880	299	7 634	7 560	3 644	13 516	380
1890	408	18 538	29 728	10 920	38 848	187
1900	758	31 851	51 870	16 881	63 878	66
1905	793	36 528	84 498	21 936	79 961	25.2

Table VIIla. FOUNDRY AND MACHINE SHOP INDUSTRY. United States.

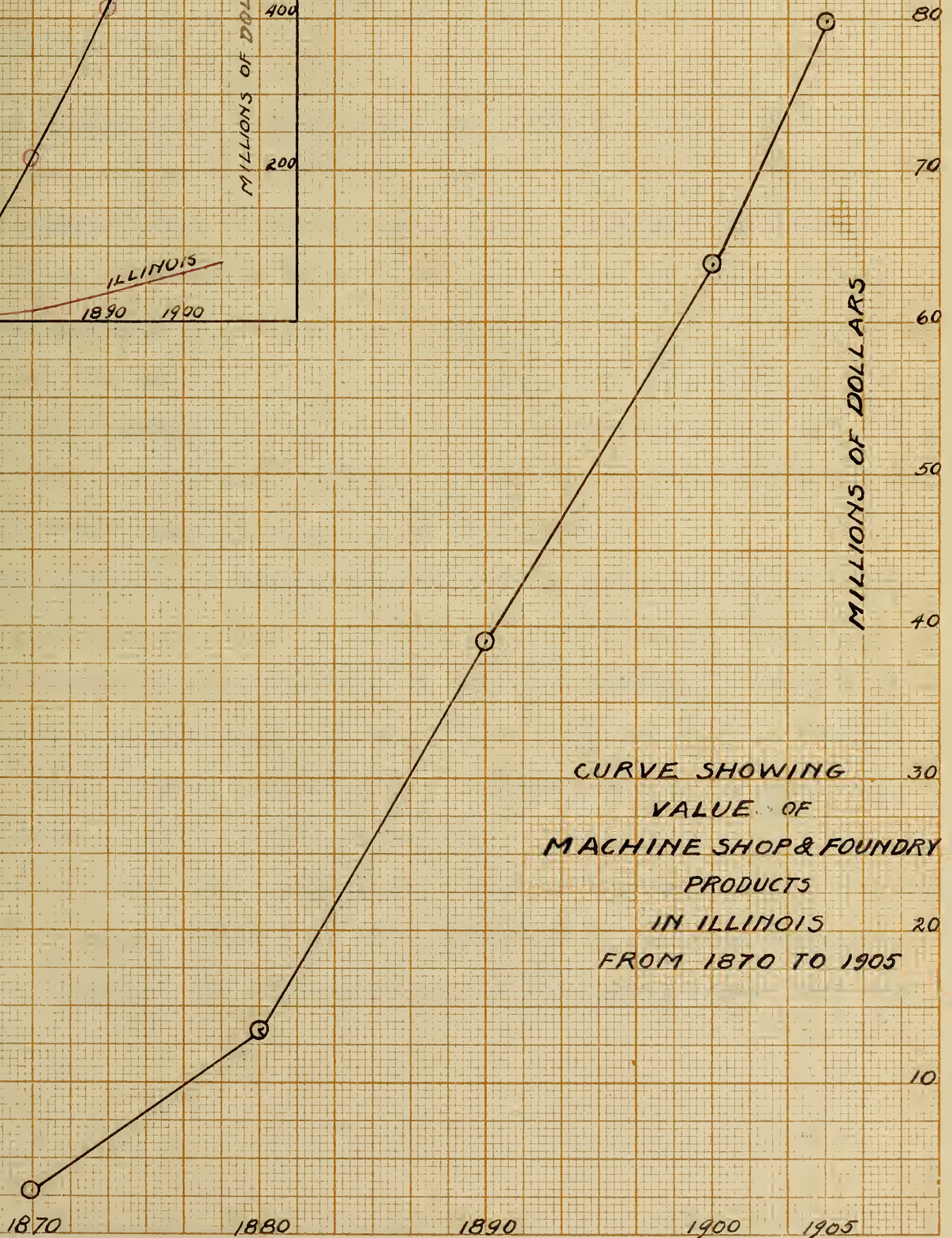
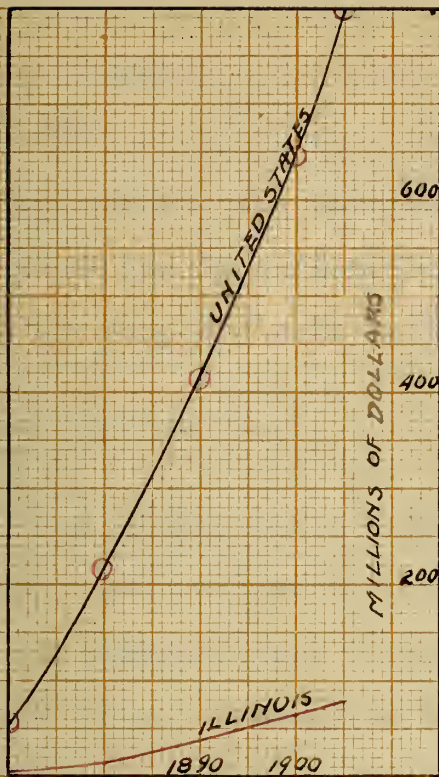
Year	Number of establish- ments	Average number of wage- earners	Capital invested	Wages paid	Value of products	Percent increase value of products
			-in thousands of dollars-			
1870	1 737	30 781	40 383	17 812	54 430	
1880	4 958	145 519	154 519	65 982	214 378	313
1890	6 475	382 798	382 798	148 389	412 702	92
1900	9 316	663 414	663 414	213 697	644 456	56
1905	9 423	936 416	936 416	282 616	799 862	24

The average percent increase in the value of the foundry and machine shop products in Illinois, has been 188 per decade for the last 35 years, and for the United States the percentage has been 139 per decade for the last 35 years. Plate VIII shows graphically the va-





TABLE VIII



CURVE SHOWING  
VALUE OF  
MACHINE SHOP & FOUNDRY  
PRODUCTS  
IN ILLINOIS  
FROM 1870 TO 1905





lue of foundry and machine shop products manufactured in Illinois, from 1870 to 1905, the points plotted representing the values for the census years. The smaller figure in the upper corner of plate VIII presents the comparison between the production of the foundry and machine shop products in Illinois and in the United States.

#### Steam Railroad Cars.

The manufacture of steam railroad cars is really a part of the foundry and machine shop industry, but its importance justifies the United States Census Bureau to treat it as a separate industry.

Illinois held first rank in the manufacture of steam railroad cars not operated by the railroad companies, during the entire period covered by the reports of the Census. More than one-third of the value of the products in Illinois is made up of passenger cars. The Pullman works at Pullman, Illinois, is one of the most important industrial establishments of its kind in the world.

This industry is highly concentrated as shown by the fact that two corporations in Illinois own the 17 establishments manufacturing steam railroad cars not operated by railroad companies, and 6 corporations own the establishments engaged in this industry in the United States. This unusual concentration is mainly due to the fact that the industry is well covered by patents.

The following table presents data on the manufacture of steam railroad cars not included in the operations of railroad companies, in Illinois and in the United States for the census years from 1870 to 1905.



Table IX. STEAM RAILROAD CAR INDUSTRY. Illinois

(not including operations of railroad companies)

Year	No. of establishments	Average number of wage-earners	Capital invested	Wages paid	Value of products	Percent increase value of products
			-in thousands of dollars-			
1870	5	849	959	502	1 010	
1880	7	1 086	772	477	2 544	150
1890	9	7 055	10 071	4 363	17 117	535
1900	16	9 314	18 732	5 361	24 846	45
1905	17	9 036	15 467	5 931	30 926	24.6

Table IXa. STEAM RAILROAD CAR INDUSTRY. United States

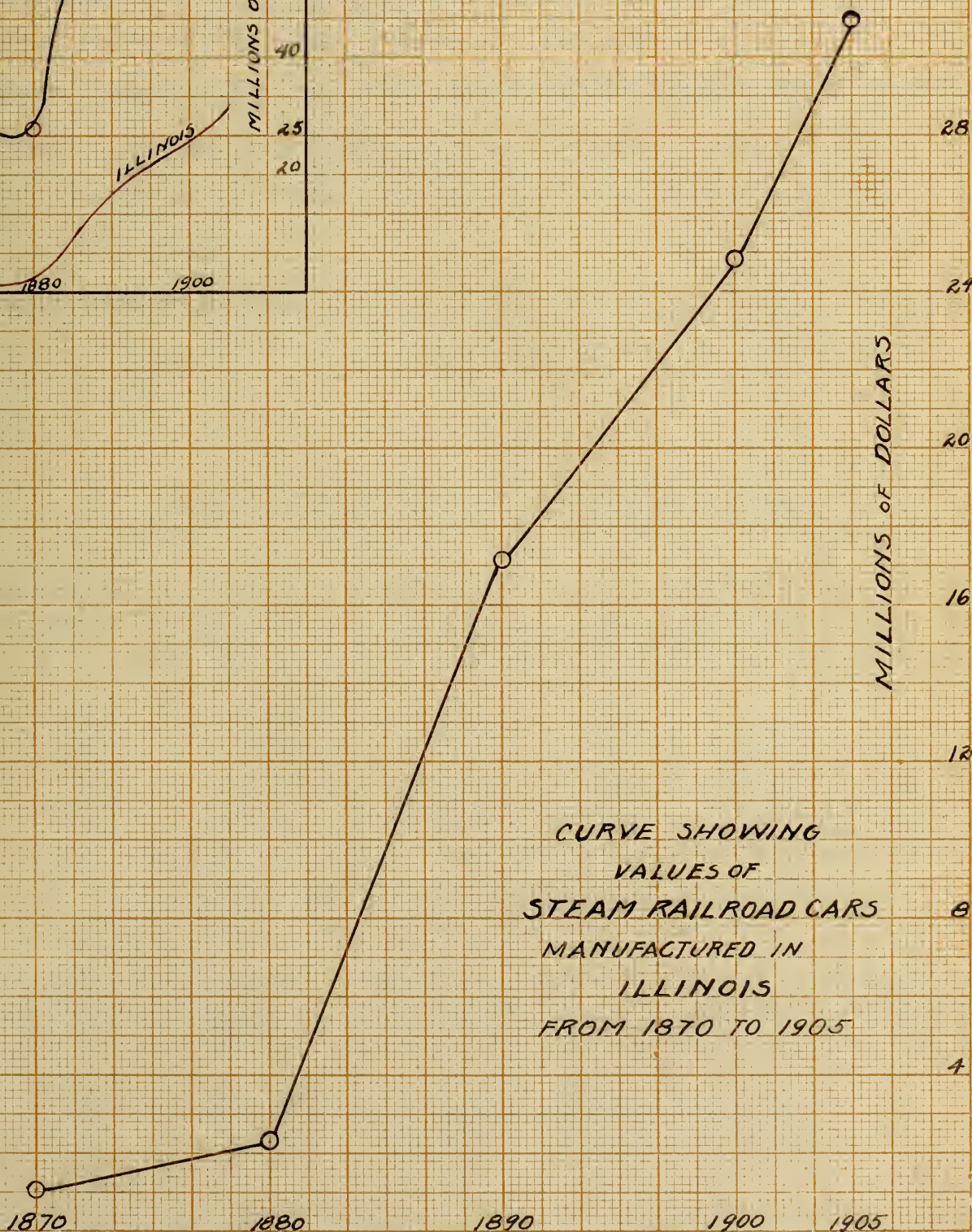
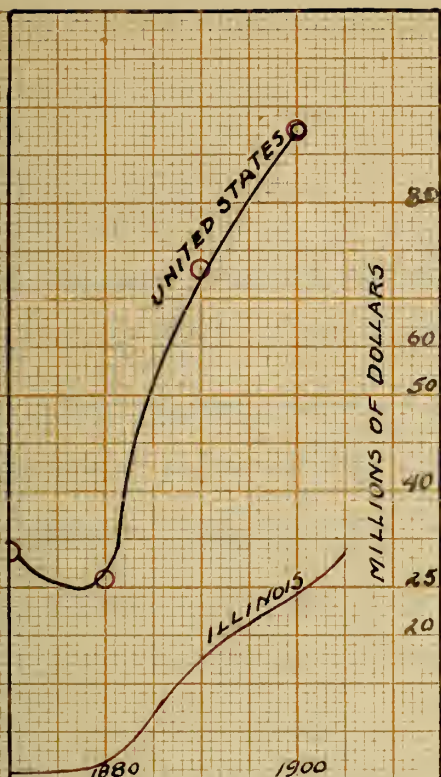
(not including operations of railroad companies)

Year	No. of establish- ments	Average number of wage- earners	Capital invested	Wages paid	Value of products	Percent increase value of products
			-in thousands of dollars-			
1870	170	15 931	16 633	9 660	31 071	-
1880	130	14 232	9 273	5 508	27 997	- 10
1890	88	33 962	46 020	18 000	73 386	163
1900	85	38 500	95 939	20 711	97 816	33.4
1905	87	41 355	101 155	26 340	122 020	25

The average percent increase in the value of the steam railroad cars, not including operations of railroad companies, manufactured in Illinois, has been 216 per decade for the years 1870-1905, and the corresponding increase for the United States, during the same period has been 60.2 percent. Plate IX presents graphically the value of the steam railroad cars manufactured in Illinois, from 1870 to 1905, the points plotted being the values for the census years. The smaller figure in the upper corner of plate IX presents a comparison between the production of steam railroad cars, not operated by rail-







CURVE SHOWING  
VALUES OF  
STEAM RAILROAD CARS  
MANUFACTURED IN  
ILLINOIS  
FROM 1870 TO 1905





road companies, in Illinois and in the United States.

### Men's Clothing.

The increase of the men's clothing industry has been very marked. In 1900 it held sixth rank among the industries of Illinois and in 1905 it attained fourth rank, with an increased value of products for those five years of nearly 50 percent. The growth of this industry has perhaps been due to the proximity of raw materials and to the establishment of large mail order houses in Chicago. In relation to the other states in the Union, Illinois holds second place in the men's clothing industry.

The following table gives the statistics of the men's clothing industry in Illinois and in the United States for the census years from 1870 to 1905.

Table X. MEN'S CLOTHING INDUSTRY. Illinois

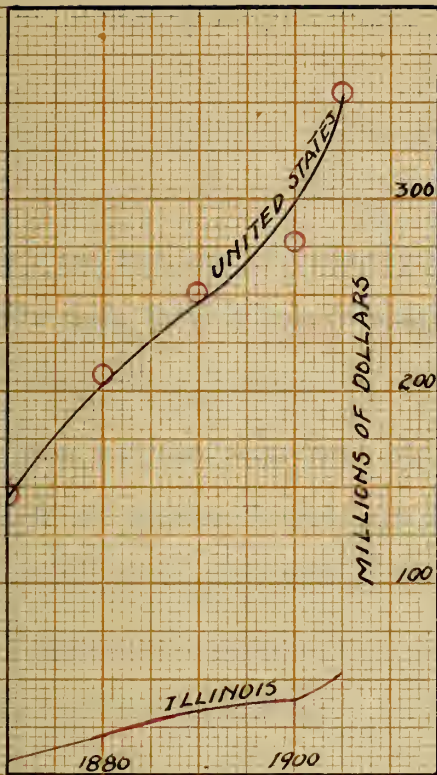
Year	Number of establish- ments	Average number of wage- earners	Capital invested	Wages paid	Value of products	Percent increase value of products
			-in thousands of dollars-			
1870	373	5 939	2 556	1 706	7 429	
1880	330	9 726	7 136	2 930	19 357	160
1890	199	16 612	13 276	6 534	33 626	74
1900	588	14 977	13 685	5 845	37 378	11
1905	900	20 283	18 835	9 799	55 203	48

Table Xa. MEN'S CLOTHING INDUSTRY. United States

Year	Number of establish- ments	Average number of employees	Capital invested	Wages paid	Value of products	Percent increase products
			-in thousands of dollars			
1870	7 838	106 679	49 891	30 536	147 650	
1880	6 166	160 813	79 862	45 940	209 548	42
1890	4 867	156 341	128 253	62 312	251 019	20
1900	5 729	130 925	120 548	55 896	276 717	10.3
1905	4 504	150 400	153 178	70 928	355 797	28.6







CURVE SHOWING  
VALUE OF  
MEN'S CLOTHING PRODUCED  
IN ILLINOIS  
FROM 1870 TO 1905





The average percent increase in the value of men's clothing manufactured in Illinois has been 83.7 per decade, for the last 35 years. The corresponding increase for the value of men's clothing manufactured in the United States in the same period has been 28.8 percent.

Plate X presents graphically the value of men's clothing manufactured in Illinois, from 1870 to 1905, the points plotted representing the values for the census years. The smaller figure in the upper corner of plate X presents the comparison between the production of men's clothing in Illinois and in the United States.

Table XI presents a comparative summary for 38 leading industries of Illinois, according to rank in value of products.

Table XI. - COMPARATIVE SUMMARY FOR 38 LEADING INDUSTRIES  
in Illinois, according to rank in value of products

Industry	Year	No. of esta- Blish- ments	Average No. of wage- earners	Capital invested	Wages paid	Value of Products	Rank
				thousands of dollars-			
Slaughtering and meat packing	1905	59	26 683	80 052	14 392	309 854	1
	1900	51	27 626	70 782	13 899	279 843	
Iron and Steel	1905	27	18 358	58 539	11 469	87 353	2
	1900	26	16 642	43 276	9 641	60 303	3
Foundry & Machine shop products	1905	793	36 508	84 498	21 937	79 961	3
	1900	758	31 851	51 871	16 881	63 878	2
Men's Clothing	1905	588	20 283	18 835	9 799	55 203	4
	1900	900	14 977	13 685	5 845	37 378	6
Distilled Liquors	1905	11	692	5 456	407	54 102	5
	1900	20	338	3 165	192	38 208	
Flour & Grist Mill Products	1905	363	2 410	14 128	1 211	39 892	6
	1900	353"	1 965	10 714	1 030	28 575	7
Agricultural Implements	1905	82	15 359	71 383	8 851	38 412	7
	1900	94	18 231	62 202	9 065	42 034	4





Table XI. - Continued

Industry	Year	No. of esta- blish- ments	Average no. of wage- earners	Capital invested	Wages paid	Value of products	Rank
				-thousands of dollars-			
Railroad Cars not including R.R.Co.	1905	16	9 036	15 467	5 931	30 926	8
	1900	17	9 314	18 732	5 361	24 846	
Printing newspa- per & publication	1905	1 390	7 205	20 337	4 789	28 645	9
	1900	1 259	7 478	12 260	3 704	19 405	11
Printing & Publ. Book & Job work.	1905	867	12 933	17 681	7 483	28 294	10
	1900	725	10 485	13 489	5 037	19 761	9
Bakery products, Bread and others	1905	1 406	7 415	13 515	4 115	26 145	11
	1900	1 064	5 559	7 294	1 395	15 879	14
Cars & Shop work R. R. Companies	1905	99	19 095	13 242	12 105	25 491	12
	1900	98	13 803	11 726	7 423	16 580	13
Malt Liquors	1905	116	4 033	39 003	3 004	23 787	13
	1900	94	3 269	32 798	2 060	19 734	10
Furniture	1905	202	12 266	16 936	6 638	22 132	14
	1900	148	9 757	10 171	4 450	15 285	15
Lumber and Planing mills	1905	270	6 994	11 003	3 970	18 296	15
	1900	240	5 122	6 551	2 576	11 142	19
Electrical mach- inery & supplies	1905	104	6 131	21 645	3 203	16 700	16
	1900	82	6 048	11 641	2 818	12 169	18
Illuminating and Gas Heating	1905	64	2 964	97 119	1 695	16 008	17
	1900	53	2 371	76 186	1 306	8 774	24
Coffee & Spice Roasting	1905	25	953	6 488	432	15 745	18
	1900	27	930	5 225	373	12 708	17
Glucose	1905	7	1 933	9 729	1 235	14 532	19
	1900	6	2 680	31 979	1 424	18 123	12
Tinsmithing, sheet iron work	1905	273	5 056	25 951	2 736	14 246	20
	1900	271	4 425	5 382	2 099	10 418	
Soap & Candles	1905	34	1 905	7 604	867	14 157	21
	1900	39	1 556	6 529	560	9 436	23
Wire	1905	4	1 905	5 414	1 341	14 100	22
	1900	3	617	1 481	334	2 878	37



Table XI. - Continued

Industry	Year	No. of esta- blish- ments	Average no. of wage- earners	Capital invested	Wages paid	Value of products	Rank
				-thousands of dollars-			
Musical Instru- ments	1905	56	7 508	16 471	3 932	13 323	23
	1900	95	4 670	11 166	2 392	8 156	27
Cheese butter & condensed milk	1905	405	1 735	5 322	829	13 277	24
	1900	527	1 483	4 466	697	12 879	16
Women's Clothing	1905	191	4 690	3 558	2 198	12 237	25
	1900	169	4 402	2 946	1 492	9 775	21
Tobacco, cigars	1905	1 788	6 675	5 157	3 463	11 669	26
	1900	1 489	5 221	3 201	2 453	8 741	25
Leather tanned, curried & finished	1905	28	2 770	11 649	1 326	10 758	27
	1900	27	2 263	4 751	1 145	7 848	29
Patent Medicines and compounds	1905	260	1 380	5 583	579	10 667	28
	1900	209	866	2 473	350	4 999	35
Carriages and Wagons	1905	290	4 186	10 839	2 320	9 799	29
	1900	335	3 979	8 463	1 955	8 276	26
Paints	1905	39	1 029	7 829	595	9 484	30
	1900	33	702	3 388	349	5 988	32
Boots & Shoes	1905	44	3 947	3 657	1 865	9 026	31
	1900	54	4 461	3 375	1 960	9 376	22
Malt liquors	1905	21	502	13 526	378	8 540	32
	1900	14	393	16 801	300	5 136	30
Confectionery	1905	87	3 587	3 704	1 170	7 646	33
	1900	64	3 079	2 253	835	6 461	31
Brick & Tile	1905	435	5 463	12 988	3 052	7 546	34
	1900	566	5 224	9 199	2 131	5 081	
Packing wooden boxes	1905	52	3 637	4 632	1 550	7 364	35
	1900	58	1 784	2 897	1 101	4 859	36
Slaughtering not inc. meat packing	1905	9	270	425	168	7 352	36
	1900	13	235	447	146	8 079	28
Lumber and timber products	1905	269	4 495	6 017	1 905	7 081	37
	1900	408	3 953	3 963	1 501	7 190	30
Pottery Terracota and fire clay	1905	45	2 416	6 608	1 243	3 256	38
	1900	53	2 005	3 512	841	2 144	





## VI.- CONCLUSIONS

The preceding tables and discussion show the growth of some of the manufacturing industries in Illinois for the last forty or fifty years, and also the relation between the growth of those same industries in Illinois and in the United States. No comparison has been with the industrial growth of the other states, excepting a note here and there in the discussion. It is, however, interesting to compare the industrial movement of this state with that of other states, since the question may properly arise whether the other states are advancing even more rapidly than Illinois. From a theses prepared by Mr. C. H. Sheldon in 1904, it appears that in 1850, Illinois ranked fifteenth in the list of manufacturing states, in 1860 had moved up to eighth place, in 1870 to fifth place, in 1880 to fourth place and by 1890 had passed Masachussets in the race, taking third place, which place it holds at the present time. In these fifty five years Illinois has passed Indiana, Kentucky, Rhode Island, New Hampshire, Missouri, Maine, Virginia, Maryland, New Jersey, Connecticut, Ohio and Masachussets.

Pennsylvania and New York have a larger output of manufactured products than Illinois, and it is interesting to notice that the growth of Illinois, on a percentage basis, is faster than either New York or Pennsylvania. In 1870 the industrial establishments of Illinois produced about 25 percent as much as New York manufacturing establishments, and about 29 percent as much as those of Pennsylvania



while in 1905, Illinois produced 58 percent as much as New York and 80 percent as much as Pennsylvania. The absolute increase however is yet so large in both Pennsylvania and New York that it will undoubtedly be many years before Illinois can take even second place in the list of manufacturing states. On the other hand there is no fear of Illinois losing its manufacturing position, for the state is increasing her manufacturing production faster than either Massachusetts or Ohio, which are the only near competitors.

In 1905, the rank of some Illinois manufacturing industries in comparison with the same industries in the other states was:

FIRST in the manufacture of steam railroad cars, in slaughtering and meat packing, in the distillation of liquors and in the manufacture of agricultural implements.

SECOND in the manufacture of men's clothing and of furniture.

THIRD in printing and publishing, in the manufacture of electrical machinery, apparatus and supplies, in the manufacture of iron and steel, and in the lumber planning mill industry.

FOURTH in clay products, in the manufacture of cheese, butter and condensed milk, in the manufacture of women's clothing, and in confectionery.

FIFTH in the manufacture of carriage and wagons, in flour and grist mill products, in food preparations, in the manufacture of glass, malt liquors, tobacco cigars and cigarretes and in the manufacture of jewelry.

Table XII shows the importance of the manufacturing industries (total) and table XIIa gives the statistics for the total manufacturing industries of the United States from 1850 to 1900.

Plate XI presents graphically the value of all the industrial products manufactured in Illinois for the period 1850-1905.





Table XII. TOTAL MANUFACTURING INDUSTRIES. Illinois

Year	No. of establishments	Average number of wage-earners	Capital invested	Wages paid	Value of products
			-in thousands of dollars-		
1850	3 162	11 559	6 218	3 204	16 534
1860	4 268	22 968	27 549	7 638	57 581
1870	12 597	82 979	94 368	31 100	205 621
1880	14 549	144 727	140 652	57 429	414 864
1890	20 482	280 218	502 005	142 873	908 640
1900	38 360	395 110	776 830	191 510	1259 730
1905	.	379 436	973 845	268 965	1410 342

Table XIIa. TOTAL MANUFACTURING INDUSTRIES. UNITED STATES

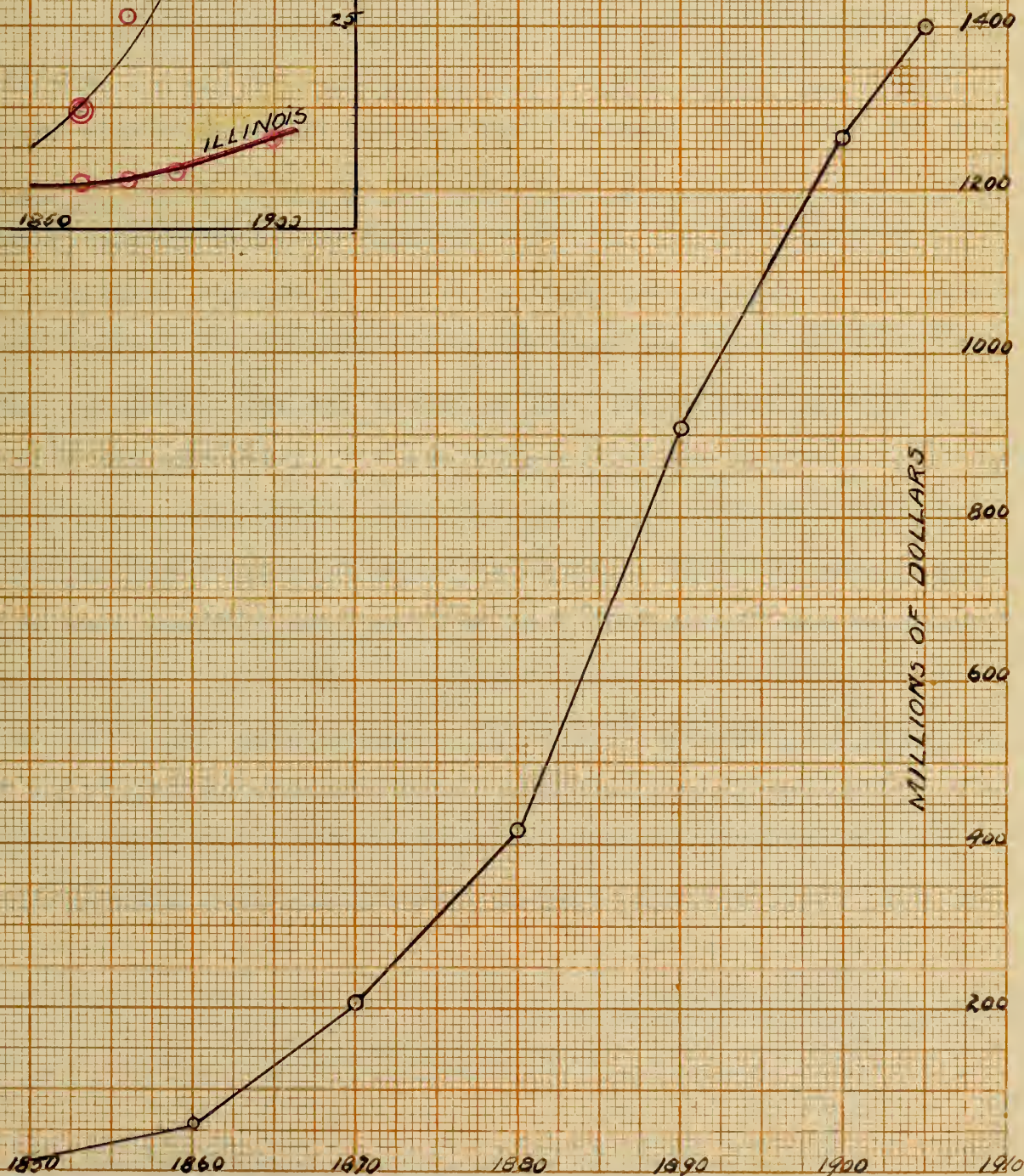
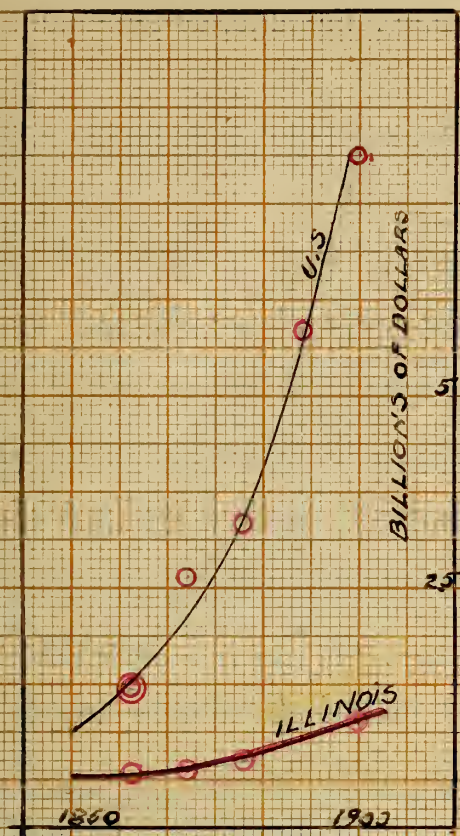
Year	No. of establishments	Average number of wage-earners	Capital invested	Wages paid	Value of products
			-in thousands of dollars-		
1850	123 025	957 059		236 755	1 019 107
1860	140 433	1 311 246	1 009 855	378 879	1 885 862
1870	252 148	2 053 996	2 118 209	775 584	4 232 325
1880	253 852	2 732 595	6 525 156	947 954	5 369 579
1890	355 415	4 712 622	9 817 435	2 283 217	9 372 437
1900	512 734	5 719 137	13 872 035	2 735 431	13 039 280

The average percent increase per decade in the number of establishments engaged in the manufacturing industries in Illinois, during the last fifty five years has been 74 and the corresponding increase for the United States has been 35.7 percent. In the number of wage earners, the average percent increase per decade in the last fifty five years has been 105 for Illinois industries and 54 for the United States. In the amount of capital invested in manufacturing, the percent increase in Illinois has been 176.5 per decade during the period 1850-1905, while the capital invested in the manufac-





CURVE SHOWING THE  
VALUE OF ALL INDUSTRIAL PRODUCT  
FOR THE STATE OF ILLINOIS  
FROM 1850 TO 1905







turing establishments of the United States has been increasing at an average percent per decade of 104 for the years 1860-1900. In the total amount of wages paid, the average percent increase per decade in the last fifty five years has been for Illinois industries 137, and for the United States during the period 1850-1900, 70. Finally in the total value of manufactured products, the average percent increase in Illinois for the last fifty five years has been 141 per decade and the average increase in the value of all the manufactured products in the United States for the period 1850-1900 has been 70.1 percent.

These statistics show clearly that Illinois industries are progressing even faster than the industries of the United States taken as a whole, nearly twice as fast.

An important feature of the industrial development to be noticed from this table is that number of establishments engaged in the manufacturing industries has not grown in the same proportion than the the other items tabulated. It is evident that the tendency of modern industries is to concentrate and unite in large establishments in order to have a stronger and wider influence. This has made necessary the union of capitalists, and the establishment of the incorporated company where the risks are divided and where the ownership is of a more or less impersonal nature. Table XIII presents the percentages of manufacturing establishments operated in Illinois under the three most common forms of organization, that is, Individual ownership, partnership, and incorporated company, for the years 1900 and 1905.



Table XIII. ORGANIZATION OF MANUFACTURING INDUSTRIES. Illinois

Character of Firm	Percent of total number of industries-Illinois	
	1900	1905
Individual	61.0	57.4
Partnership	19.5	17.3
Incorporated company	18.5	23.8
Miscellaneous	1.0	1.5

This table shows an increase for the incorporated companies, while the individual firms seem to be still the most numerous. When we turn, however, to the real basis of comparison, that is, to the ownership of capital and to the value of products turned out, we find that the industry of Illinois is no longer individualistic, but of a corporate nature. For 33 selected industries we find that the capital owned by incorporated companies is 89.2 percent of the total and the value of the products is 81.1 percent. these figures have a strong significance for the socialization of industries, specially the most important ones, and for the adoption of concentrated energy and effort to apply sound principles to the production of wealth.

The state of Illinois is well prepared to sustain the place that it now occupies in the industrial development of the United States. It has well developed industries, as shown in the preceeding pages; it has a large supply of raw materials near at hand; it has abundant transportation facilities, both by water and rail, which provide a market as large as the world; and more important still it has a large and enterprising population, energetic and patriotic, in whose care can well be left the future progress of this great state.



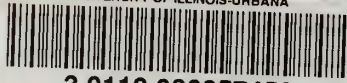








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